LISTING OF CLAIMS

The listing of claims below will replace all prior versions and listings of claims in the present application.

Claim Listing

1. (Original) A method comprising:

receiving a request to load a device policy module into a memory, wherein the device policy module is for use by a device driver, and wherein the device policy module includes at least one of a function, a procedure, and an object-oriented method operable to perform at least one of input/output (I/O) operation scheduling, path selection, and I/O operation error analysis;

loading the device policy module into the memory; and

informing the device driver of availability of the device policy module.

2. (Original) The method of claim 1 wherein the request to load a device policy module into a memory is received form at least one of a user application and a device discovery application.

3. (Original) The method of claim 1 wherein a portion of the memory comprises a kernel memory space, and wherein the loading the device policy module into the memory further comprises:

loading the device policy module into the kernel memory space.

4. (Original) The method of claim 1 wherein the informing the device driver of availability of the device policy module further comprises:

registering the device policy module with the device driver by calling at least one of a function, a procedure, and an object-oriented method associated with the device driver.

5. (Original) The method of claim 1 further comprising:
determining whether the device policy module is currently present in the memory.

6. (Original) The method of claim 1 further comprising:
informing the device driver of unavailability of the device policy module.

7. (Original) The method of claim 6 wherein the informing the device driver of unavailability of the device policy module further comprises:
unregistering the device policy module with the device driver by calling at least one of a function, a procedure, and an object-oriented method associated with the device driver.

8. (Original) The method of claim 1 wherein the device policy module is for use with a corresponding storage device, the method further comprising:
transmitting at least one storage device attribute to the device driver.

9. (Original) The method of claim 1 wherein the at least one of a function, a procedure, and an object-oriented method of the device policy module is specific to a particular storage device.

10. (Original) The method of claim 1 wherein the at least one of a function, a procedure, and an object-oriented method operable to perform at least one of I/O operation scheduling, path selection, and I/O operation error analysis performs at least one of:
selecting one of a plurality of communication pathways to at least one storage device;
selecting one or more sub-devices of the at least one storage device which will be affected due to a communication pathway failure;
selecting an alternate communication pathway in case of a failure of one of the plurality of communication pathways;

changing a current communications pathway from a first one of the plurality of communication pathways to a second one of the plurality of communication pathways;

responding to SCSI reservation/release requests; and

selectively transmitting I/O operations along at least two of the plurality of communication pathways to the at least one storage device.

11. (Original) The method of claim 1 further comprising:

monitoring operation of the device policy module.

12. (Original) The method of claim 1 further comprising:

discovering the presence of at least one storage device belonging to a distributed computing system.

13. (Original) The method of claim 12 further comprising:

determining whether the at least one storage device has a corresponding device policy module.

14. (Original) A system comprising:

a storage device discovery module configured to determine information about at least one storage device belonging to a distributed computing system; and

a multipath driver in communication with the storage device discovery module and configured to direct input/output (I/O) operations along at least one of a plurality of communication pathways to the at least one storage device, the multipath driver including:

an interface configured to communicate with a device policy module including at least one of a function, a procedure, and an object-oriented method operable to perform at least one of I/O operation scheduling, path selection, and I/O operation error analysis.

15. (Original) The system of claim 14 further comprising:

a device policy module including at least one of a function, a procedure, and an object-oriented method operable to perform at least one of I/O operation scheduling, path selection, and I/O operation error analysis.

16. (Original) The system of claim 15 wherein the at least one of a function, a procedure, and an object-oriented method of the device policy module is specific to a particular storage device.

17. (Original) The system of claim 14 wherein the at least one of a function, a procedure, and an object-oriented method operable to perform at least one of I/O operation scheduling, path selection, and I/O operation error analysis performs at least one of:

select one of the plurality of communication pathways to the at least one storage device;

select one or more sub-devices of the at least one storage device which will be affected due to a communication pathway failure;

select an alternate communication pathway in case of a failure of one of the plurality of communication pathways;

effect a communications pathway changeover;

respond to respond to SCSI reservation/release requests; and

selectively transmit I/O operations along at least two of the plurality of communication pathways to the at least one storage device.

18. (Original) The system of claim 17 wherein the at least one storage device is a disk array and wherein the one or more sub-devices are disk drives.

19. (Original) The system of claim 14 further comprising:

a memory; and

a processor coupled to the memory, wherein at least one of the storage device discovery module and multipath driver are encoded as instructions stored in the memory and executable on the processor.

20. (Original) The system of claim 19 wherein a first portion of the memory is used as a kernel memory space and wherein a second portion of the memory is used as a user memory space, and wherein the multipath driver is stored in the kernel memory space.

21. (Original) The system of claim 14 wherein the multipath driver further comprises:

a fixed set of I/O policies including at least one of a function, a procedure, and an object-oriented method operable to perform at least one of I/O operation scheduling, path selection, and I/O operation error analysis.

22. (Original) The system of claim 14 wherein the interface configured to communicate with a device policy module includes at least one of a function, a procedure, and an object-oriented method operable to perform at least one of registering a device policy module with the multipath driver and unregistering a device policy module with the multipath driver.

23. (Original) The system of claim 14 wherein the multipath driver is further configured to monitor at least one loaded device policy module.

24. (Original) The system of claim 14 wherein the multipath driver is further configured to receive at least one of a request to load a device policy module and a request to unload a device policy module.

25. (Original) The system of claim 14 wherein the information about at least one storage device includes at least one device attribute and wherein the device discovery module is further configured to transmit the information about at least one storage device to the multipath driver.

26. (Original) The system of claim 25 wherein the at least one device attribute includes at least one of: a number of paths to the device, primary path information, secondary path information, connected path information, disconnected path information, vendor information, an enclosure serial number, and an LUN serial number, an array type.

27. (Original) The system of claim 14 wherein the storage device discovery module is further configured to transmit the information about at least one storage device to the multipath driver.

28. (Original) The system of claim 14 wherein the storage device discovery module is further configured to receive at least one of a request to load a device policy module and a request to unload a device policy module.

29. (Original) A computer readable medium comprising program instructions executable on a processor, the computer readable medium being at least one of an electronic storage medium, a magnetic storage medium, an optical storage medium, and a communications medium conveying signals encoding the instructions, wherein the program instructions are operable to implement each of:

receiving a request to load a device policy module into a memory, wherein the device policy module is for use by a device driver, and wherein the device policy module includes at least one of a function, a procedure, and an object-oriented method operable to perform at least one of input/output (I/O) operation scheduling, path selection, and I/O operation error analysis;

loading the device policy module into the memory; and

registering the device policy module with the device driver.

30. (Original) The computer readable medium of claim 29 wherein the request to load a device policy module into a memory is received form at least one of a user application and a device discovery application.

31. (Original) The computer readable medium of claim 29 wherein a portion of the memory comprises a kernel memory space, and wherein the program instructions operable to implement the loading the device policy module into the memory further comprise program instructions operable to implement:

loading the device policy module into the kernel memory space.

32. (Original) The computer readable medium of claim 29 wherein the program instructions operable to implement the registering the device policy module with the device driver further comprise program instructions operable to implement:

calling at least one of a function, a procedure, and an object-oriented method associated with the device driver.

33. (Original) The computer readable medium of claim 29 further comprising program instructions operable to implement:

determining whether the device policy module is currently present in the memory.

34. (Original) The computer readable medium of claim 29 wherein the at least one of a function, a procedure, and an object-oriented method of the device policy module is specific to a particular storage device.

35. (Original) The computer readable medium of claim 29 wherein the at least one of a function, a procedure, and an object-oriented method operable to perform at least one of I/O operation scheduling, path selection, and I/O operation error analysis comprises program instructions operable to perform at least one of:

selecting one of a plurality of communication pathways to at least one storage device;

selecting one or more sub-devices of the at least one storage device which will be affected due to a communication pathway failure;

selecting an alternate communication pathway in case of a failure of one of the plurality of communication pathways;

changing a current communications pathway from a first one of the plurality of communication pathways to a second one of the plurality of communication pathways;

responding to SCSI reservation/release requests; and

selectively transmitting I/O operations along at least two of the plurality of communication pathways to the at least one storage device.

36. (Original) The computer readable medium of claim 29 further comprising program instructions operable to implement:

monitoring operation of the device policy module.

37-40. (Cancelled)